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ABSTRACT

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S.O.S. For Information Literacy: A Tool for Improving Research and Information Skills Instruction

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ABSTRACT

At no time in history has the ability to locate, organize, evaluate, manage and use information, skills collectively referred to as information literacy, been more important to today's learners. Classroom and technology teachers and library media specialists are challenged to find effective, innovative techniques for teaching research and information skills, especially to young children. This paper summarizes the research conducted for a U.S. Department of Education Phase I SBIR award. The project utilized digital video, database, and information technologies, to design a proof-of-concept prototype for a comprehensive Web-based tool, ***S.O.S.,*** *for improving instruction in this critical area. Educators identify relevant situation-specific variables* ***(S.)*** *and desired instructional outcomes* ***(O.)****. Suggested instructional strategies* ***(S.)*** *are subsequently generated. These strategies are linked to a database of real-world video and multimedia examples.* ***S.O.S.*** *will be responsive to advancing technology and include system feedback mechanisms as well as direct user input for continuous formative evaluation and improvement. By integrating sound pedagogical principles with real-world practice presented in video and multimedia demonstrations, the project will make a valuable contribution to the quality of information literacy skills instruction.*

Introduction

This paper highlights the main activities and results of an SBIR Phase I project to research and design a proof-of-concept prototype for improving instruction in information literacy. It utilized digital video, database, and information technologies in a comprehensive tool, ***S.O.S. for Information Literacy,*** for improving instruction in this critical area. Educators identify relevant situation-specific variables ***(S.)*** and desired instructional outcomes ***(O.)***. Suggested instructional strategies ***(S.)*** are subsequently generated. These strategies are linked to a database of real-world video demonstrations.

A high degree of success was achieved for all Phase I objectives. Top level objectives included 1) performing a front-end analysis to determine how best to design a Web-based information system that meets the needs of its target audience (elementary library media specialists and teachers) 2) designing the Phase I specifications (e.g., scope/organization of content, project curriculum, and design specifications for the proof-of-concept prototype, 3) producing the Phase I prototype including data structure, sample videos, and user feedback mechanisms, and 4) evaluating the proof-of-concept prototype across a number of variables including ease of use, technical reliability, quality of content, interface design and general appeal. Major accomplishments included:

- The development of an online Research Management Site provided an excellent environment within which the Phase I research activities occurred and will prove useful as the project continues into its development phase.
- A survey of 192 practitioners supplied critical information on the target audience's needs and preferences as well as clarification of a number of content issues.
- A questionnaire to faculty and leaders (n = 8) illuminated the need to add several subskills to the search parameters in Phase II, and provided useful information for dissemination of S.O.S. project information.
- Input evaluation resulted in guidelines for software development and video production.
- Production, post production, and compression of 18 sample videos demonstrated that quality video could be delivered via the web at high compression schemes.
- Sophisticated data structure and query systems were the outcomes of software development over two iterations of the proof-of-concept prototype.

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- A Focus Group (n = 11) of potential users helped to elucidate the results of the earlier practitioners' survey and to beta test the first iteration of the prototype.
- Evaluation of 2nd iteration prototype by a Progressive Feedback Panel (n = 11) yielded valuable information for Phase II development relating to functionality, technical quality, and interface and design issues.

The remainder of this paper will briefly discuss each of the above accomplishments, and conclude with information on current development efforts.

Development of Research Management Site

The Research Management Site (RMS) was a controlled online environment within which the Focus Group and Progressive Feedback Panel activities took place. The Focus Group (which will be described later) tested the first iteration prototype while the Progressive Feedback Panel tested a later version. The RMS was first developed in HTML and then brought into the WebCT Courseware so that threaded discussions could take place. Additionally, it served as a jumping off spot to link to the S.O.S. beta test site and as a return point to continue in the Focus Group or Progressive Feedback Panel mode. The success of conducting research within the RMS environment in Phase I has set the stage for successful research efforts in Phase II.

Results of Online Practitioners' Survey

A 40-item survey was designed to gather feedback on potential curriculum content, perceived usefulness of the product, and plans for current and future technology implementation in respondents' schools and homes. The survey was designed as a comprehensive set of items including multiple choice, short answer, and open-ended questions. The first draft of the survey was piloted with 32 graduate students enrolled in a class called "Instructional Strategies and Techniques for Information Professionals" at Syracuse University, School of Information Studies. The pilot test served three purposes: 1) test the appropriateness of the survey's dissemination medium, 2) test the robustness of the dissemination medium, and 3) garner item feedback. After some modifications the survey was announced on several listservs (e.g. LM_NET, ED-TECH) and 192 library media specialists, teachers, and technology coordinators responded.

Ninety-four percent (94%) of respondents indicated that the S.O.S. system as described would be either "useful" or "very useful" to library media specialists and 85% felt it would be "useful" or "very useful" to classroom teachers. Participants were given a number of potential uses for S.O.S. and, while the majority indicated the importance of all the options, using S.O.S to help with lesson planning (85%; 163) was the highest rated response. Stimulating ideas (80%; 152), providing background information (67%; 127), and allowing practitioners to compare strategies provided with current practice (65%; 124) were also highly rated uses. Fifteen (8%) indicated "other" (e.g. professional development, use in education courses). Information was also gathered on information skills and subskills to include in the system. Respondents overwhelmingly agreed that the inclusion of lesson plans would be a highly motivating component of S.O.S. and that standards tie-ins would also be important.

Questionnaire to Selected College Educators and Leaders in the Field

The purpose of the questionnaire was to gather consensus on the appropriate scope of content to include in the S.O.S. tool and to gather feedback on the proposed features of the tool. A group of 11 individuals was initially targeted for participation. Eight of 11 responses were received. The results of this survey were clarifications of several skills and the addition of several subskills to search options for the tool in Phase II. This group provided useful suggestions for publicizing and motivating educators to use S.O.S. Respondents also provided a number of suggestions for S.O.S. features which included:

- A listserv to allow people to trade comments and make suggestions as well as contribute lessons
- A way to add comments/reflections to the site which would then be available to others to peruse
- Printable lesson plans
- Links to content standards
- Lessons that reflect collaboration with classroom teachers in specific subject areas
- Printed transcripts of video/audio clips

Input Evaluation

Early on, an input evaluation was conducted in-house and extended to several outside consultations with technology persons who frequently work with Creative Media Solutions. Technical specifications for software development were considered and a preliminary web-based data entry structure was planned using an SQL client/server environment. Many video issues were also considered such as what features were accessible by the majority of educators that would be testing our product and what long-range features could be anticipated for the ultimate release of the product. Decisions about frame size, delivery format, and compression algorithms were made after testing factors such as download time of various options with typical users' computer systems. These decisions are discussed further in the sections below.

Video Production and Acquisition

Only original materials produced by Creative Media Solutions were planned for the prototype. Eighteen videos were included in the prototype ranging in length from approximately :25 to 4:30 minutes. Teachers and librarians from 4 Northeast states participated: New York, Pennsylvania, Massachusetts, and New Hampshire. In addition to videos produced entirely by the company, two videos were compiled from still photos sent in by a school in a Boston, Massachusetts suburb. Photos covering a six-week unit by a teacher in New Hampshire were also compiled into a multimedia PowerPoint presentation.

The style of production is similar to ENG production (electronic news gathering) in that the production team consists of the producer and videographer and sometimes an assistant. This is necessary because what happens in the course of a teaching episode is not entirely predictable; sometimes the camera is on the tripod and other times it is simply handheld. The production team attempts to be as non-intrusive as possible during the videotaping. There is generally little discussion ahead of time as to where in the library media center the librarian or students will be at any one time. The videographer simply documents the events.

With several exceptions, the production team was not allowed to videotape children's faces. This posed a challenge but did not compromise the quality of production.

The library media specialist was generally interviewed *after* the teaching episode. By conducting the on-camera interview afterwards, the producer/interviewer could frame her questions in the context of the actual lesson and the reactions from children she observed.

Each raw videotape (unedited field tape) was reviewed and shots or soundbites (also referred to as "clips") logged using timecode that would help to demonstrate a particular strategy. Scripts were written to guide the editing process providing detail on all shots selected including their sequence and sometimes duration. Interview soundbites were included and narration was written where needed. Any transitions (e.g., dissolves, wipes, etc.), music/effects, and text were also noted in the script. Voiceovers were recorded when appropriate.

The selected clips and voiceovers were then captured into the computer using Firewire and digital capturing software made by Pinnacle. Next, the captured clips were brought into editing software such as Media 100 or Adobe Premiere (for this example, Adobe Premiere) and laid out on a timeline. Titles and identifying text were created including a summary of the strategy used. Voiceovers were added when indicated. Transitions were created.

The timelines with all their elements were rendered as complete movies in AVI uncompressed format at 360 X 240 pixels down from their original size of 720 X 480 pixels. As planned, the finished AVI movies were taken into another industry standard program called Media Cleaner Pro for compression and . reduced to a 240 X 180 pixel frame size and rendered with Sorenson compression at 15 frames per second with audio at 22 kh.

The final step was adding the video to the video demonstration database to be linked to strategies and lesson plans.

Two professional looking albeit simple (in terms of video production techniques) videos that the Progressive Feedback Panel felt represented an acceptable alternative to only motion videos in the database were created from still photos sent in by a teacher in Massachusetts, proving to be a viable and cost-effective alternative to only motion videos.

A number of implications for future acquisitions of video content were determined. They include but are not limited to loaning library media specialist/teacher teams digital video or digital still cameras for 2 - 3 months at a time to capture teaching *in action* clips. The equipment would be bicycled to different areas to expand geographic coverage. The alternative production method, mentioned earlier, of using still photos to create a video would also open up participation to many individuals. All footage and stills would be sent to Creative Media Solutions for post-production including adding voiceovers, titles, etc., helping to maintain a consistent look. Online training resources

to be developed in Phase II could help prepare teams for acquiring video and preparing their work for submission to the S.O.S. project.

Development of Data Structure and Query System for Initial Prototype

Phase I technical development goal was to collect information from a variety of sources, provide a mechanism to enter or query data, and deliver a wide variety of media as efficiently as possible to a diverse market. This solution was then integrated into a comprehensive Web site.

Data Structure. A relational database was custom developed to insure all facets of the project goals could be realized. A number of changes and additions were added to the database over the development cycle. Bringing the vision of the academic information literacy professional and translating into technical development introduced a series of challenges that were overcome. The solution consists of over thirty data tables, hundreds of data relationships and a client server interface as well as a Web interface. The final product has almost no artificial limits to data entry. Strategies can be related to lesson plans, lesson plans can be related to strategies and an unlimited number of resources can be attached to either. Supported resources include but not necessarily limited to; QuickTime video, Power point, text, QuickTime audio, pictures, and Web links. Special care was taken to allow content to be cross-referenced.

Another important aspect to consider was data entry. The user interface was designed to allow professional staff to quickly learn the necessary skills and offer automated entry functions when possible. Feedback on navigation, view, data required on screen and the complexities of identifying all the associated links were all considered. This is an evolving process, but the current solution has met the data entry requirements to this point.

Query. Query screens fall into two categories. Within the client server environment, queries have relatively unlimited options and occur very quickly. The query is an integrated function of the development software. As the complex data relationships that empower the information are ported to the web, significant slowdowns occurred. This was an anticipated result and a number of solutions are possible. The initial investment was made in understanding the data flow and allowing for the data to be entered correctly. As indicated above, this led to a number of adjustments. Optimization of code occurs in logical sequence, and every adjustment has a potential ripple effect throughout the code that is not always possible to predict. The next phase of development will focus on additional data indexing; relationship based queries, and a continued focus on utilizing the best technology tools available at the time of product delivery. During Phase I, the focus was on utilizing Active Server Pages with SQL queries embedded into the HTML page and CHTML tags with proprietary software. We feel that all issues of query speed from a Web centric view will be resolved transparent to the user. It is also anticipated that more features will be added to the data structure that will impact the solution as development continues.

Data delivery. Data delivery from the Web site introduced a number of variables inherent in the diverse world of Internet users. The expectation was data would be accessed by a current Web browser, would require Flash and Quicktime plug-ins, and the user would have dedicated Internet access. This expectation was not what occurred. This solution requires the ability to develop and distribute complex pieces of information. Multiple versions of multiple browsers demand constant day to day troubleshooting. From our research, we can see just how problematic this can be. For example, Netscape, particularly in earlier versions, did not fare as well as Internet Explorer with our prototype. There is a wide array of variables unique to each browser and specific version. The problem then becomes "which version do we adjust code to support"? As mentioned previously the effect of software adjustments at one level can and will affect results in other levels. Some panel members using both old browsers and old "systems" required technical support from our staff in order to complete the research. The compatibility problem is further complicated by the fact that competition has the various browsers introducing newer, better, faster features but that the different browsers (while trying to maintain competitiveness) still do so at different paces.

A decision that faces every developer is whether to adjust code to the lowest common denominator approach or choose a solution somewhere between the lowest and the highest common denominator. This project demands fairly complex searches on multiple variables. It includes videos, some of which can be up to four or five minutes in length. What our research is indicating, from a technical perspective, is that the lowest common denominator approach will not be the best one for this project. While some web databases do just fine with this

approach, they do not have the many additional variables to deal with as one such as the S.O.S. project with its multimedia content.

Judging from the results provided by users, the complexity of supporting multiple browsers limits delivery options to an unacceptable level. Internet Explorer version 5 or greater has proven to be the most reliable with this project. Current versions of Internet Explorer and Netscape will likely be recommended as viewing engines. Perhaps, by the time this resource is available, the browsers will have achieved an overall consistency that eliminates this issue. For now, the delivery goal will dictate browser selection and support. Browsers are typically free, are upgraded regularly, and have many settings and options to enhance web experiences.

Will our decision eliminate many potential users? The question is not whether the site can be viewed, but more precisely can the site be experienced to the full potential. It is not unusual today to see messages such as "best viewed by..." While we may lose some users, we will try to minimize that loss by making the necessary software or upgrades easily available to the user. Furthermore, most current computer operating systems include versions of both Netscape and Internet Explorer. Navigating the site in the preferred browser should be less of a problem. Information reduces anxiety. Providing information to the user about technical needs for an optimum experience will also reduce possible frustration when problems are encountered but users don't know why.

Results of Focus Group

The Focus Group consisted of 11 pre-service and in-service educators (potential future users of S.O.S.) most of whom were library media specialists. They were from New York State, North Carolina, and Virginia. Because of the distributed geographic location of focus group participants, all focus group sessions were conducted online using the Research Management Site and WebCT's asynchronous discussion feature rather than the traditional face-to-face method. The Focus Group provided valuable feedback on important issues that related to the scope of content, inclusion of standards, value of lesson plans, variety of videos, amount of information presented in videos, links, and a number of other issues. At this point in the research, only content and curriculum related issues were explored. Interface and design issues were not addressed in the Focus Group. They reviewed content issues in the context of a very plain and simple interface on a beige background. This group also provided input that resulted in the adoption of the national information literacy standards put forth in *Information Power: Building Partnerships for Learning* published by the American Association of School Librarians (AASL) and the Association of Educational Communications and Technology (AECT) in 1998, as the basis of the standards search. Quality control of content was also considered an important attribute of the future tool. The Focus Group provided a number of possible ways to insure quality control of content including a quality assurance committee, expansion of the online feedback mechanism, and the development of an evaluation tool. The consensus seemed to be that anything uploaded to the S.O.S. site should be considered a quality product.

Evaluation with Progressive Feedback Panel

Based on feedback and recommendations from the Focus Group, the development team made modifications and additions to the initial prototype for testing with another group of educators described below. In this iteration, videos were linked to the strategy or lesson plan generator in which search variables included specific situation (grade and context) and outcome (information skills and subskills) variables. The results of such a search are strategies or lesson plans which have links to a video/multimedia database. We also added a video **"quick search"** where a user can search on a video topic using only a topic keyword.

A comprehensive questionnaire was developed by the principal investigator and senior project consultant that would elicit feedback in two main areas 1) Searching functionality across strategies and videos, lesson plans, topics, and standards, and 2) Interface and design. This site was then presented to the Progressive Feedback Panel who helped us evaluate the 2nd iteration of the proof-of-concept prototype in the above areas and on specific issues that included: ease of use, features that might attract educators, quality of content, technical quality, menu buttons, color appeal, etc. (Whereas the Focus Group was concerned with content issues and functionality, this group was also concerned with interface issues.)

Information Literacy
Home
Welcome to S.O.S. for Information Literacy, a virtual idea factory for educators teaching information skills to children in grades K-5!
Powerful Teaching Ideas That Really Work!
In the Spotlight
A Picture (or Video) is Often Worth a Thousand Words . . .
A Message From Project Director, Dr.

Figure 1: Screen capture showing top half of homepage illustrates interface design of 2nd iteration prototype

The Panel consisted of several members from the original Focus Group plus new members. This configuration was chosen to provide a balance between continuity of feedback and fresh input from persons not previously connected with the project. Eight library media specialists, 2 classroom teachers, and 1 district-wide technology coordinator comprised the group. They were given instructions for reviewing the site individually, and subsequently filled out a comprehensive questionnaire.

In addition to rating various aspects of the tool on a scale, participants provided many useful suggestions via open-ended comments. The Panel gave S.O.S. high scores (4.1; n = 11) on the intuitiveness of searching with the Strategy and Lesson Generators (1 = not intuitive; 5 = very intuitive). They gave an even higher score (4.4; n = 11) on the usefulness of the "related resources" which included videos, lesson plans, graphics, etc. Such resources are intended to help clarify, enrich, or reinforce the teaching strategies suggested by the strategy generator.

In terms of quality of video, most comments reflected high enthusiasm for the videos. "This is some of the highest quality [video] I have seen on the web!!!" wrote one respondent. Another wrote: "It is always valuable to hear from colleagues. When I see the enthusiasm of the person in the video, it makes me more likely to try their strategy. The videos are a valuable part of S.O.S." There were some comments, however, that indicated concern about the speed of access of the videos. Some of the longer videos took an extremely long time to load if the user did not have a direct connection to the Internet.

Figure 2: Screen capture from selected video depicting current frame size in relation to page.

Participants commented that the voiceovers which were added to some of the videos were of professional quality, helped to clarify points made by the speaker (educator), and were effective in providing transitions.

After seeing two examples demonstrating an alternative video production technique, almost all Panel members agreed that allowing educators to submit photos that could be edited into a video with a voiceover added would provide a valuable alternative to all motion video. An important point was made that many educators still feel more comfortable with a still camera than a video camera. Finally, the opinions were mixed on the value of including video transcripts but one important comment was made that transcripts may be useful for the hearing impaired.

Some Panel members felt the current size of the video frame used in the prototype was

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adequate; others felt it should be twice as large. Figure 2 illustrates the current frame size in relation to the page. The user arrives at the screen in Figure 2 after selecting a particular video from the list of Related Resources (to the strategy or lesson plan) which includes brief descriptions of the available videos. As technology advances allow, we anticipate increasing the size of the video at least two-fold. We selected the current size in order to conduct research with users who would not have been able to accommodate the larger video size at this time due to unreasonable loading times.

Comments were solicited on the usefulness of the search function for information literacy standards. This search is based on the national standards as presented in *Information Power, Building Partnerships For Learning* (1998). Responses were generally positive and included: "This is a good search. Often we are looking for a specific idea to teach a standard required in our curriculum and this will be a good resource for it." Another wrote: "This will be handy when my co-librarian and I are in the midst of our curriculum and benchmarks we are writing based on the ILS [information literacy standards] from *Information Power*. Great examples."

The user can select one of the broader standards or narrow the search to include only those lessons that relate to a specific indicator of the standard. Future development will broaden the search to include all video and related resources as well.

Although not implemented in the prototype, participants were asked to assess how useful it would be to search S.O.S. by nationally recognized content area standards such as those compiled by the Mid-Continent Research for Education and Learning (McREL) in addition to searching by information literacy standards. On a scale of 1 (not useful) to 5 (very useful), this item received a 3.7. One Panel member wrote: "I believe the national standards are adequate. Users can interpolate where the standard they are looking for is within the national standards."

Panel members offered suggestions for improving the Topic Search function including providing drop-down menus of topics, clarifying directions, providing the ability to browse available topics, and adding a help menu. Positive comments included those who liked the "quickness" and "ease" of the search in addition to its potential helpfulness in searching for ideas to integrate into classroom instruction.

From a design and navigational perspective, S.O.S. was well received. It had received a complete overhaul from the simple design and layout of the initial prototype beta tested by the Focus Group. Panel members commented positively on the colors, banner, the appealing look, and layout. One member wrote: "I love the design and colors used in the site . . . the way the menu buttons move is great! I like the logo of the earth and the banner. Information is shared all over the world." That is the message that the banner was meant to reflect and it seemed to be readily recognized.

Finally, comments from both the Focus Group and the Faculty/Leaders Questionnaire had previously mentioned the desirability of including a section where visitors could find news, features, special videos, or other information. This was included in the 2nd prototype iteration which the Progressive Feedback Panel reviewed. The "Spotlight" section of the site was enthusiastically accepted. Responses were almost universally positive. One person commented on its potential value for encouraging collaboration which is one of the project's underlying goals. *"In the Spotlight"* for this prototype included a feature story on a teacher from New Hampshire who cleverly wove eight information skills into a 6-week Social Studies unit on communities. In fact, her students actually built a play community in the woods behind their school as a way of learning the concepts. Also *"In the Spotlight"* was a library media specialist talking about ways to foster collaboration between classroom teachers and library media specialists. This was presented as a video interview. This component of S.O.S. will help the site maintain a current feel and may be expanded in future development efforts.

From Phase I to Current Development

Creative Media Solutions, Inc. is continuing to develop *S.O.S. for Information Literacy* through a strategic alliance with Grant Systems, Inc., as new sources of funding are explored. Since the authors have always planned on making this resource freely available to educators, creative means of sustaining the project are necessary.

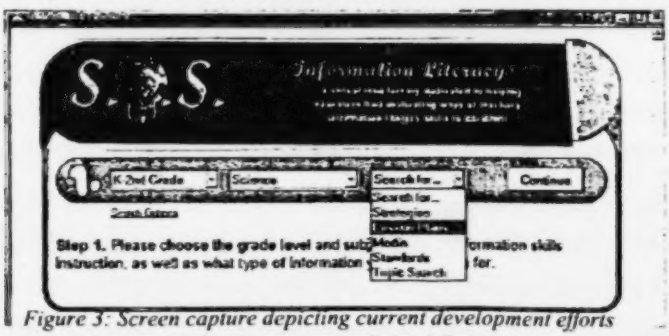

Figure 3: Screen capture depicting current development efforts to produce streamlined searches and simplified design

Already, a number of improvements have been accomplished as a result of the input from the Phase I research. Search screens are now much more streamlined and require no scrolling. After selecting grade levels, subject area, and type of search (see

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Figure 3), for example, the user can select both information skill(s) and subskill(s) in one easy step. The color scheme, considered pleasant (blue and gold tones) by the Progressive Feedback Panel, has been retained but the screen design has been simplified. An online submission template which will allow educators to upload media such as digital stills and PowerPoint presentations along with their lesson plans is currently being developed. As soon as completed, library media specialists and classroom teachers will be recruited to submit materials to populate the database. Once the database has sufficient materials for meaningful queries, it will be made available to educators at large.

Evaluation of all materials submitted to the database will be an important aspect of S.O.S. Before being made available online, new submissions will be reviewed by a two-person team of evaluators using an evaluation rubric similar to that used in the U.S. Department of Education's Gateway to Educational Materials (GEM) project. A Web-based interface for evaluators to review and score submissions is currently being developed.

Finally, the *S.O.S. for Information Literacy* information system will be expanded to include middle school grades.

Summary

The successful completion of all technical objectives for Phase I not only demonstrated the project's feasibility but also provided a strong framework for the successful continuation of the research and development effort. Most importantly, there was a high degree of agreement by educators in each of the research components conducted that *S.O.S. for Information Literacy* would be a valuable and needed addition to improving the teaching of information literacy at the elementary and middle school grade levels.

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